PLASMA WATER VAPOR KINETICS AND PLASMA-LIQUID INTERACTIONS

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Abstract

Non-equilibrium atmospheric pressure plasmas interacting with water offer a unique source of highly reactive chemistry beneficial for many applications [1]. This presentation will provide an overview of the current state-of-the-art of plasma-liquid interactions and identify key research challenges. I will focus on the plasma kinetics in the gas/vapor phase and the interfacial transfer of reactivity from the gas to the liquid water phase.

Although the water plasma kinetics of a diffuse atmospheric pressure glow discharge has been developed and partially validated [2], our current understanding of the complex kinetics in ubiquitous high electron density filamentary water containing discharges is limited. I will present results of a detailed study of a filamentary transient discharge in Ar-H_2O in which ionic reactions are important. Our current predictive modeling capabilities of the non-equilibrium water kinetics will also be summarized and additional remaining challenges will be identified.

In addition, I will discuss our recent results related to the transfer of reactive species in the context of plasma-biointeractions and nanoparticles synthesis at the plasma-liquid interface. My group has performed a large set of experiments with different plasma conditions leading to large variations in reactive species fluxes to the liquid [3,4]. This allowed us to indentify different chemical reaction pathways for plasma-biointeractions. The results clearly illustrate the importance of the plasma-liquid interface as a source of highly reactive chemistry. The important interpfacial processes will be discussed in detail.

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References

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